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First Named Inventor

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Date	July 15, 2005	Reg. No.	41,405

CERTIFICATE OF TRANSMISSION/MAILING

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PATENT
Attorney Docket No.: 16869K-103100US
Client Ref. No.: 637 SM/at

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Naotaka Kobayashi *et al.*

Application No.: 10/754,371

Filed: January 9, 2004

For: STORAGE DEVICE
CONTROLLING APPARATUS
AND METHOD OF
CONTROLLING THE SAME

Customer No.: 20350

Examiner: Unassigned

Technology Center/Art Unit: 2182

Confirmation No.: 7589

**RENEWED PETITION TO MAKE
SPECIAL FOR NEW APPLICATION
UNDER M.P.E.P. § 708.02, VIII & 37
C.F.R. § 1.102(d)**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Decision dated May 31, 2005 dismissing the original petition to make special, Applicants respectfully submit a renewed petition to make special the above-identified application under MPEP § 708.02, VIII & 37 C.F.R. § 1.102(d). The application has not received any examination by an Examiner.

(a) The Commissioner has previously been authorized to charge the petition fee of \$130 under 37 C.F.R. § 1.17(i) and any other fees associated with this paper to Deposit Account 20-1430.

(b) All the claims are believed to be directed to a single invention. If the Office determines that all the claims presented are not obviously directed to a single invention, then Applicants will make an election without traverse as a prerequisite to the grant of special status.

(c) Pre-examination searches were made of U.S. issued patents, including a classification search, a foreign patent database search, and a literature search. The searches were performed on or around October 5, 2004, and were conducted by a professional search firm, Mattingly, Stanger & Malur, P.C. The classification search covered Class 709 (subclasses 213, 214, and 219), Class 710 (subclasses 5 and 200), and Class 711 (subclasses 152 and 163). Because of the large size of these subclasses, keywords were used to narrow of number of documents returned. The foreign patent database search was conducted using Espacenet in international subclass G06F13/12P4, directed to transfers of information between memories, processor, or I/O devices on a network. The literature search was performed using DIALOG online databases. The inventors further provided two references considered most closely related to the subject matter of the present application (see references #8-9), which were cited in the Information Disclosure Statement filed on January 9, 2004.

(d) The following references, copies of which were previously submitted, are deemed most closely related to the subject matter encompassed by the claims:

- (1) U.S. Patent No. 5,423,044;
- (2) U.S. Patent No. 6,105,099;
- (3) U.S. Patent Publication No. 2003/0204671 A1;
- (4) U.S. Patent Publication No. 2004/0103099 A1;
- (5) U.S. Patent Publication No. 2004/0133650 A1;
- (6) U.S. Patent Publication No. 2004/0133718 A1;
- (7) U.S. Patent Publication No. 2004/0139167 A1;
- (8) U.S. Patent Publication No. 2002/0152339 A1; and
- (9) Japanese Patent Publication No. JP 2002-351703.

(e) Set forth below is a detailed discussion of references which points out with particularity how the claimed subject matter is distinguishable over the references.

A. Claimed Embodiments of the Present Invention

The claimed embodiments relate to a storage device controlling apparatus and a method thereof to provide fast access to files. In an exemplary embodiment, a lock table is used for performing exclusive control on file accesses from the information processing apparatuses. The lock table includes a file lock table to perform exclusive control at a file level, and a logical-volume lock table to perform exclusive control at a block level. See, e.g., Fig. 14.

Independent claim 1 recites a storage device controlling apparatus including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed, the file access processing section receiving requests to input and output data in files as units sent from at least one information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to the requests to input and output data to a storage device. The apparatus comprises an exclusive control section performing exclusive control of a file when the channel controller receives from the information processing apparatus the requests to input and output data of the file; a file lock table to be used by the exclusive control section to perform exclusive control, at a file level, on file accesses received by the file access processing section; and a logical-volume lock table to be used by the exclusive control section to perform exclusive control, at a block level, on file accesses received by the file access processing section.

Independent claim 4 recites a storage device controlling apparatus including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed, the file access processing section receiving requests to input and output data in files as units sent from an information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to the requests to input and output data to a storage device. The apparatus comprises a section receiving from the information processing apparatus a request for information specifying a storage location of a file on a memory area of the storage device, and sending the information to the information processing apparatus; a section receiving a request to read data in blocks as units from the information processing apparatus, in which the request is generated based on the information, and outputting an I/O request corresponding to the request to read data to the storage device; a section sending data read from the storage device to the information processing apparatus; a file lock table to be

used by the channel controller to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used by the channel controller to perform exclusive control, at a block level, on file requests received by the file access processing section.

Independent claim 6 recites a storage device controlling apparatus including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed, the file access processing section receiving requests to input and output data in files as units sent from an information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to the requests to input and output data to a storage device. The apparatus comprises a section receiving from the information processing apparatus a request for information specifying a storage location of a file on a memory area of the storage device, and sending the information to the information processing apparatus; a section receiving a request to write data in blocks as units and data to be written from the information processing apparatus, in which the request is generated based on the information, and outputting to the storage device an I/O request corresponding to the request to write data and the data to be written; a file lock table to be used by the channel controller to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used by the channel controller to perform exclusive control, at a block level, on file requests received by the file access processing section.

Independent claim 8 recites a storage device controlling apparatus including a plurality of channel controllers, each having a circuit board on which a file access processing section and an I/O processor are formed, the file access processing section receiving requests to input and output data in files as units sent from an information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to the requests to input and output data to a storage device. The apparatus comprises a section setting at least one of logical volumes logically set on a memory area of the storage device as a shared logical volume accessible from each of the channel controllers; a section performing fail-over based on take-over information of each of the channel controllers, in which the take-over information is stored in the shared logical volume and used when one of the channel controllers takes over processing of another one of the channel controllers; a file lock table to

be used by the channel controller to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used by the channel controller to perform exclusive control, at a block level, on file requests received by the file access processing section.

Independent claim 10 recites a storage device controlling apparatus including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed, the file access processing section receiving requests to input and output data in files as units sent from at least one information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to the requests to input and output data to a storage device. The file access processing section stores identification information of accessible the information processing apparatus, and accepts the requests to input and output data only in a case where the requests to input and output data are sent from the information processing apparatus for which the identification information is stored. The apparatus further comprises a file lock table to be used by the channel controller to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used by the channel controller to perform exclusive control, at a block level, on file requests received by the file access processing section.

Independent claim 11 recites a method of controlling a storage device controlling apparatus including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed, the file access processing section receiving requests to input and output data in files as units sent from at least one information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to the requests to input and output data to a storage device. The method comprises receiving the requests to input and output data of a file from the information processing apparatus by the channel controller; and performing exclusive control of the file, which includes performing exclusive control, at a file level, on file requests received by the file access processing section using a file lock table, and performing exclusive control, at a block level, on file requests received by the file access processing section using a logical-volume lock table.

Independent claim 14 recites a method of controlling a storage device controlling apparatus including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed, the file access processing section receiving requests to input and output data in files as units sent from an information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to the requests to input and output data to a storage device; and a section receiving a request to read data in blocks as units sent from the information processing apparatus, and outputting an I/O request corresponding to the request to read data to the storage device. The method comprises receiving a request for information specifying a storage location of a file on a memory area of the storage device from the information processing apparatus, and sending the information to the information processing apparatus; receiving the request to read data in blocks as units from the information processing apparatus, in which the request is generated based on the information; performing exclusive control, at a file level, on file requests received by the file access processing section using a file lock table, and performing exclusive control, at a block level, on file requests received by the file access processing section using a logical-volume lock table; outputting the I/O request corresponding to the request to read data to the storage device; and sending data read from the storage device to the information processing apparatus.

Independent claim 16 recites a method of controlling a storage device controlling apparatus including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed, the file access processing section receiving requests to input and output data sent in files as units from an information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to the requests to input and output data to a storage device; and a section receiving a request to write data in blocks as units sent from the information processing apparatus, and outputting an I/O request corresponding to the request to write data to the storage device. The method comprises receiving a request for information specifying a storage location of a file on a memory area of the storage device from the information processing apparatus, and sending the information to the information processing apparatus; receiving the request to write data in blocks as units and data to be written from the information processing apparatus, in which the request is generated based on the information; performing exclusive control, at a file level, on

file requests received by the file access processing section using a file lock table, and performing exclusive control, at a block level, on file requests received by the file access processing section using a logical-volume lock table; and outputting the I/O request corresponding to the request to write data and the data to be written to the storage device.

Independent claim 18 recites a method of controlling a storage device controlling apparatus including a plurality of channel controllers, each having a circuit board on which a file access processing section and an I/O processor are formed, the file access processing section receiving requests to input and output data in files as units sent from an information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to the data to input and output data to a storage device. The method comprises performing exclusive control, at a file level, on file requests received by the file access processing section using a file lock table, and performing exclusive control, at a block level, on file requests received by the file access processing section using a logical-volume lock table; setting at least one of logical volumes logically set on a memory area of the storage device as a shared logical volume accessible from each of the channel controllers; and performing fail-over based on take-over information of each of the channel controllers, in which the take-over information is stored in the shared logical volume and used when one of the channel controllers takes over processing of another one of the channel controllers.

Independent claim 20 recites a method of controlling a storage device controlling apparatus including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed, the file access processing section receiving requests to input and output data in files as units sent from at least one information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to the requests to input and output data to a storage device. The method comprises performing exclusive control, at a file level, on file requests received by the file access processing section using a file lock table, and performing exclusive control, at a block level, on file requests received by the file access processing section using a logical-volume lock table; storing identification information of accessible the information processing apparatus by the file access processing section; and accepting the requests to input and output data only in a case where the requests to input and output data are sent from the information processing apparatus for which the identification information is stored.

One of the benefits that may be derived is that control of fast access to files is highly effective when accessing a file of a large data size.

B. Discussion of the References

1. U.S. Patent No. 5,423,044

This reference discloses a shared, distributed lock manager for loosely coupled processing systems. The manager operates using a partitionable lock space with logical processor connection.

The reference merely discloses an apparatus and process for managing shared distributed locks in a multiprocessing complex in which locks synchronize data access to identifiable sub-units of direct access storage devices. It does not teach or suggest a file lock table to be used to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used to perform exclusive control, at a block level, on file requests received by the file access processing section, as recited in independent claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20.

2. U.S. Patent No. 6,105,099

This reference discloses a method for synchronizing use of dual and solo locking for two competing processors responsive to membership changes. Each processor maintains a lock table listing that processor's access state regarding the shared resource. Each processor repeatedly sends the other processor a state announcement message representing the processor's state.

The reference shows at FIG. 1B a digital data storage system in which storage adapters house respective lock tables. However, it does not teach or suggest a file lock table to be used to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used to perform exclusive control, at a block level, on file requests received by the file access processing section, as recited in independent claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20.

3. U.S. Patent Publication No. 2003/0204671 A1

This reference discloses a storage having NAS and SAN functions and a high degree of freedom to configure a system to reduce the management and operation cost. The storage includes a plurality of interface slots in which a plurality of interface controllers can be installed, a block I/O interface controller which has SAN functions and which can be installed in the slot, a file I/O interface controller which has NAS functions and which can be installed in the slots, a storage capacity pool including a plurality of disk devices accessible from the interface controllers, and a storage capacity pool controller to control the storage capacity pool.

The reference discloses a plurality of NAS clients in communication with a storage system having a plurality of channel controllers. However, it does not teach or suggest a file lock table to be used to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used to perform exclusive control, at a block level, on file requests received by the file access processing section, as recited in independent claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20.

4. U.S. Patent Publication No. 2004/0103099 A1

This reference discloses an inter-network relay storage apparatus that executes data relay between separated networks using a storage apparatus and performs exclusive control between systems in an operation equivalent to the case of a network connection. The relay storage apparatus has a storage unit having a data area for storing files to be transferred between the networks in file units, and a file management table for indicating the access status to the file, and data management unit for performing exclusive control between file systems for each one of the networks using the file management table. The exclusive control is performed in file units.

The reference shows a storage apparatus that performs exclusive control by using a file management table for indicating access status to a file. However, it does not teach or suggest a file lock table to be used to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used to perform exclusive control, at a block level, on file requests received by the file access processing section, as recited in independent claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20.

5. U.S. Patent Publication No. 2004/0133650 A1

This reference relates to a decoupling client computers from file servers in a computer network by placing a network node (i.e., a file switch) between the client computers and the file servers. The file switch aggregates the file servers' responses to the client computer's request and presents a single response back to the client computer, and performs this transaction aggregation function in a manner that is transparent to both the client computers and the file servers.

The reference merely shows a file switch computer that performs transaction aggregation functions in a manner that is transparent to client computers on a network and to a plurality of file servers. Although it includes a locking capability, it does not teach or suggest a file lock table to be used to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used to perform exclusive control, at a block level, on file requests received by the file access processing section, as recited in independent claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20.

6. U.S. Patent Publication No. 2004/0133718 A1

This reference discloses a direct access storage system with combined block interface and file interface access. It shows a direct access storage system that includes interfaces for responding to block-level and file-level I/O requests. The storage controller includes suitable interfaces for receiving the read/write requests and effecting the reading of data to or the writing of data to the storage media.

While the reference includes a lock manager for determining whether access to a requested file is available (paragraphs [0044]-[0048]), it does not teach or suggest a file lock table to be used to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used to perform exclusive control, at a block level, on file requests received by the file access processing section, as recited in independent claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20.

7. U.S. Patent Publication No. 2004/0139167 A1

This reference discloses a scalable network attached storage system. The system includes one or more termination nodes, one or more file server nodes for maintaining

file systems, one or more disk controller nodes for accessing storage disks respectively, and a switching fabric coupling the one or more termination nodes, file server nodes, and disk controller nodes. The one or more termination nodes, file server nodes, and disk controller nodes can be scaled as needed to meet user demands.

The reference merely discloses a scalable network attached storage system that includes a switching fabric coupling one or more termination nodes, file server nodes, and disk controller nodes. However, it does not teach or suggest a file lock table to be used to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used to perform exclusive control, at a block level, on file requests received by the file access processing section, as recited in independent claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20.

8. U.S. Patent Publication No. 2002/0152339 A1

This reference discloses a direct access storage system with combined block interface and file interface access. The system includes a storage controller and storage media for reading data from or writing data to the storage media in response to SCSI, NFS, CIFS, or HTTP type read/write requests. The storage controller includes SCSI, NFS, CIFS, and HTTP interface adapters for receiving the read/write requests and effecting the reading of data to or the writing of data to the storage media.

While the reference includes a lock manager for determining whether access to a requested file is available (paragraphs [0035]-[0039]), it does not teach or suggest a file lock table to be used to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used to perform exclusive control, at a block level, on file requests received by the file access processing section, as recited in independent claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20.

9. Japanese Patent Publication No. JP 2002-351703

This reference discloses providing a storage device that is easy to manage by effectively utilizing a drive capacity in the coexisting environment of the storage device of block form data and that of file form data. A block data input/output processing part 10-a converts block data and an address from a fiber channel port 50 to a data format inside of the

storage device 1. A file data input/output processing part 10-b converts file data and an address from an Ethernet to the data format of the file system 20. The file system 20 indexes the address of a logical volume 35-b from the address of the system 20 and converts the file data into block data. A logical volume management part 30 indexes the address of a logical volume 35-a for writing the block data from the address outputted by a processing part 10-a, converts this address or the address from the file system 20 to a physical address and writes/reads data to a drive.

The reference discloses a NAS system in which a network using TCP/IP protocols or the like connects a storage system and information processing apparatuses to implement access in file level from the information processing apparatuses. See present application at page 1, line 25 to page 2, line 3. It does not teach or suggest a file lock table to be used to perform exclusive control, at a file level, on file requests received by the file access processing section; and a logical-volume lock table to be used to perform exclusive control, at a block level, on file requests received by the file access processing section, as recited in independent claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20.

(f) In view of this petition, the Examiner is respectfully requested to issue a first Office Action at an early date.

Respectfully submitted,



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